REMARKS

Claims 1 to 13 are all the claims pending in the application, prior to the present Amendment.

The Examiner makes of record the telephone restriction requirement and applicant's telephone election of the invention of Group I, claims 1-2. Applicants hereby affirm this election.

Claim 2 has been rejected under the second paragraph of 35 U.S.C. § 112 as indefinite.

The Examiner states that claim 2 describes a system of two equations with four unknown parameters T1, T2, A and B. The Examiner states that the application does not contain any examples illustrating the subject matter of claim 2.

Applicant submits that claim 2 complies with the requirements of the second paragraph of 35 U.S.C. § 112, and, accordingly, requests withdrawal of the rejection.

Claim 2 recites a formula of $T = (700 + A) - B [\log (F)]$, wherein A and B are constants. This is the formula that is used to determine the firing temperature of claim 2, and is hereafter referred to as formula (1).

The present specification discloses at page 10, line 8 to page 11, line 19, that the values "A" and "B" are determined from the results of firing experiments of two cerium carbonates having different fluorine contents.

After the constants A and B are inserted into the above formula, the firing temperature T of the above formula is determined when the fluorine content of cerium carbonate is inserted into the above formula.

The constants A and B are predetermined by the following two formulae set forth in claim 2, which are hereafter referred to as formula (2) and formula (3), respectively.

$T1 = (700 + A) - B [\log (F1)]$ formula (2)

$T2 = (700 + A) - B [\log (F2)]$ formula (3)

In the above two formulae (2) and (3), T1 and F1, and T2 and F2, are predetermine optimum firing temperatures and fluorine contents of two cerium carbonates different in fluorine content and optimum temperature. That is, by preliminarily determining optimum firing temperatures for two cerium carbonates different in fluorine content, constants A and B are predetermined.

Therefore, since constants A and B are predetermined, the firing temperature T of formula (1) is determined by inserting the fluorine content of cerium carbonate into the formula.

In summary, there is only one formula ($T = (700 + A) = B [\log (F)]$), namely, formula (1), that determines the firing temperature T, and constants A and B are not unknown parameters in the formula.

Further, even in the two formula (2) and (3): $T1 = (700 + A) - B [\log (F1)]$ and $T2 = (700 + A) - B [\log (F2)]$, there are only two unknown parameters A and B, and the optimum firing temperatures T1 and T2 are known and predetermined from the specific cerium carbonates having specific fluorine contents. As a result, since there are two formulae and two unknown parameters A and B, two parameters A and B are determined. Therefore, claim 2 is not clear.

Further, the present invention resides in a method comprising the step of determining constants A and B in the formulae in claim 2 by experiment as described above. Although constants A and B vary depending on a specific cerium carbonate to be fired, a furnace and firing

condition as well as optimum crystallization feature and optimum specific surface area, constants A and B can be determined when the specific cerium carbonate to be fired, furnace and firing conditions as well as optimum crystallization feature and optimum specific surface area are fixed.

Figs. 1 and 2 show Examples of the invention as claimed in claim 2.

By way of further explanation, the desired firing temperature is determined based on the desired specific surface area of cerium oxide to be obtained.

An example of setting the firing temperature for a cerium carbonate material is shown below.

Referring to Fig. 1 of the present application, the dotted line shows the medium of the preferred specific surface area range of 9.5 to 12.2 m^2/g, as disclosed in the present specification at page 9, lines 24-27, which medium is 10.85 m^2/g. Accordingly, 10.85 m^2/g is a preferred specific surface area. The solid lines in Fig. 1 show the relationship between the specific surface area of the fired cerium oxide and the firing temperature of a high purity cerium carbonate for various fluorine contents. Therefore, the crossing point of the dotted line and one of the solid lines showing the fluorine content of the cerium carbonate to be fired indicates the firing temperature of the cerium carbonate to be fired to obtain a preferred specific surface area of 10.85 m^2/g.

When the fluorine content of a high purity cerium carbonate is less than 5 ppm (the uppermost solid line), the crossing point of the solid line for the fluorine content of less than 5 ppm and the dotted line indicates the firing temperature of 777°C. When the fluorine content of a high purity cerium carbonate is 300 ppm (the lowermost solid line), the crossing point of the

solid line for the fluorine content of 300 ppm and the dotted line indicates the firing temperature of 747°C. Less than 5 ppm can be substantially neglected, as mentioned in the specification. The above values are inserted into the formulae in claim 2 as below.

$$777 = (700 + A)$$

$$747 = (700 + A) - B(\log 300)$$

Then, A = 77 is derived from the first formula. Therefore, B can be obtained by inserting A = 77 into the second formula. As a result, obtained is B = 12.

In view of the above, applicant requests withdrawal of this rejection.

Claims 1 and 2 have been rejected under 35 U.S.C. § 103(a) as obvious over JP 2003-082333 to Uchino et al.

Applicant submits that JP 2003-082333 to Uchino et al does not disclose or render obvious the presently claimed invention as set forth in claims 1 and 2 and, accordingly, requests withdrawal of this rejection.

The present invention as set forth in claim 1 as amended above is directed to a method for setting a firing temperature of cerium carbonate which is to be fired to produce a cerium oxide abrasive having a specific surface S, wherein the cerium carbonate has a fluorine content falling within a range of 10 to 500 ppm by mass, said method comprising the steps of: a relationship between fluorine content f of cerium carbonate and firing temperature t for the cerium carbonate having fluorine content f which firing temperature t provides a cerium oxide abrasive having specific surface area S, for a firing furnace and firing conditions, and setting the firing temperature of cerium carbonate to be fired for said firing furnace and firing conditions to firing

temperature t_1, said cerium carbonate to be fired having fluorine content f_1, said firing temperature t_1 being derived from said previously obtained relationship wherein the fluorine content f is fluorine content f_1.

The Examiner asserts that Uchino et al disclose a cerium oxide abrasive material and a method of production wherein a rare earth cerium carbonate is fired at a temperature of between 400 and 800°C. The Examiner asserts that Uchino et al disclose in Table 2 that the content of the cerium oxide abrasive is from 0.02 to 0.014 wt%.

The Examiner acknowledges that Uchino et al do not teach a formula for setting the firing temperature. The Examiner argues that since the temperature range of 400-800°C and the fluorine concentration of 0.02 to 0.014 wt% disclosed in Uchino et al are consistent with the ranges set forth in the present specification, one of ordinary skill in the art would be motivated to perform firing at these ranges. The Examiner argues that this represents an optimization within the prior art conditions through routine experimentation.

The Examiner argues that, generally, differences in concentration or temperature will not support the patentability of subject matter encompassed by the prior art, unless there is evidence indicating such concentration or temperature is critical.

As set forth above, the present invention resides in a method for setting a firing temperature of cerium carbonate which is to be fired to produce a cerium oxide abrasive, the cerium carbonate having a fluorine content falling within a range of 10 to 500 ppm, and comprises the step of setting the firing temperature in accordance with the fluorine content.

In the present invention, the method relates to setting a firing temperature of cerium carbonate having a fluorine content falling within a range of 10 to 500 ppm, and comprises the

step of previously obtaining a relationship between fluorine content of cerium carbonate and firing temperature to obtain a cerium oxide abrasive with a specific surface area, and setting the firing temperature in accordance with the previously obtained relationship and the fluorine content of the cerium carbonate to be fired.

Applicant submits that the raw material for producing the cerium-based abrasive particles in Uchino et al is not the cerium carbonate that is to be fired in the present invention.

Uchino et al disclose in paragraph [0040] that the raw material of a cerium-based abrasive according to the Uchino et al invention is "either one of a rare earth carbonate, or a calcined rare earth carbonate," and in paragraph [0044] state that when calcining is employed, the calcining temperature is 400 to 800°C.

Paragraph [0048] states that the "raw material used here is a rare earth carbonate having" the characteristics shown in paragraph [0049]. In paragraph [0049], Uchino et al disclose a working Example of the raw material for producing the cerium based abrasives in paragraph [0048]. Uchino et al disclose that the raw material is a rare earth element carbonate comprising 58% of cerium oxide, based on TREO, and that TREO comprises 67% of the raw material. This raw material is not the cerium carbonate to be fired to produce cerium oxide in the present invention. The raw material to be fired in the present invention is a high purity cerium carbonate, as disclosed, for example, at page 13, lines 10-11 of the present specification. As disclosed at page 2, lines 20-22 of the specification, cerium carbonate having a metallic ion impurity content of less than 100 ppm is commercially available.

Further, the Examiner asserts that Uchino et al disclose in Table 2 that the fluorine content is from 0.02 to 0.014 wt%.

However, the fluorine content in Table 2 of Uchino et al is not the fluorine content of the starting rare earth carbonate, but is the fluorine content of the roasted product of Uchino et al that is obtained by roasting the specimens of Table 1 of Uchino et al at a "roasting" temperature of 850°C to 1020°C for different fluorine concentrations..

Table 1 shows the fluorination treatment of the starting specimens that were subject to roasting, with Specimens 1 and 2 being specimens without a fluorination, Specimens 3 and 4 being specimens that were subjected to a fluorine treatment concentration of 3%, and the specimens of the Comparative Examples 1 and 2 being specimens that were subjected to a fluorine treatment concentration of 6%.

The 3% and 6% concentrations correspond to 30,000 and 60,000 ppm, which are far outside the 10 to 500 ppm range of claim 1.

The Specimens 1 and 2 without fluorination produced TREO having, as shown in Table 2, 0.02 and 0.014 % fluorine concentrations, which corresponds to 200 and 140 ppm. These amounts are based on the final, fired TREO product, and not on the starting cerium carbonate, and, therefore, do not satisfy the recitations of claim 1.

The starting rare earth carbonate used to produce the specimens in Table 1 of Uchino et al had a fluorine content of 0.16 % (1600 ppm) based on TREO, and had a cerium oxide concentration of 58% based on TREO, as disclosed in paragraph [0049]. Applicant submits that a starting rare earth carbonate having a fluorine content of 0.16 % (1600 ppm) based on TREO, and having a cerium oxide concentration of 58% based on TREO, as disclosed in paragraph [0049], does not satisfy or suggest the recitations of the present claims of a cerium carbonate

having a fluorine content of 10 to 500 ppm. Accordingly, Uchino et al do not disclose the starting cerium carbonate of claim 1.

In Tables 1 and 2 of Uchino et al, the non-calcined material of paragraphs [0048] and [0049] is roasted at temperatures of 850 to 1020°C. The firing temperature in the present invention generally would be from about 690°C to about 780°C, as shown in Fig. 2. Uchino et al disclose a calcining temperature of 400 to 800°C, but do not disclose any example of calcining. Applicant has added a new claim 14 directed to a firing temperature of about 690 to 780°C.

In contrast to the present invention, Uchino et al disclose a method for producing a slurry of cerium-based abrasive particles comprising a total rare earth oxide content of 96% by weight or more. The raw material for producing the cerium-based abrasive particles is a rare earth element carbonate comprising 58% of cerium oxide, based on TREO. See paragraph [0049]. As discussed above, this raw material is not the cerium carbonate to be fired to produce cerium oxide in the present invention.

The rare-earth carbonate mentioned in paragraph [0044] of Uchino et al is one which is calcined at a temperature in a range of 400-800°C, before the so-calcined rare-earth carbonate comprising rate-earth oxide is fired at 800-1100°C to produce a cerium oxide abrasive. See paragraph [0035]. Therefore, Uchino et al do not disclose firing cerium carbonate to produce a cerium oxide abrasive as in the present invention, and the firing temperature to produce a cerium oxide abrasive is 800-1100°C, which is different from the firing temperature in a range of about 690 to about 780°C shown in Fig. 2 of the present invention.

Thus, the raw material to be fired is essentially different between Uchino et al and the present invention, and the firing temperature is essentially different between Uchino et al and the present invention.

Further, Uchino et al do not disclose the step of setting the firing temperature in accordance with the fluorine content, in which a certain correlation between the firing temperature and the fluorine content has been the firing temperature and the fluorine content has been previously determined to obtain the desired crystallization feature and specific surface area of cerium oxide.

Therefore, the present invention is essentially different from Uchino et al, and Uchino et al do not suggest the present invention at all.

In view of the above, applicant submits that Uchino et al do not disclose or render obvious the presently claimed invention and, accordingly, request withdrawal of this rejection.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,

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Date: December 18, 2008